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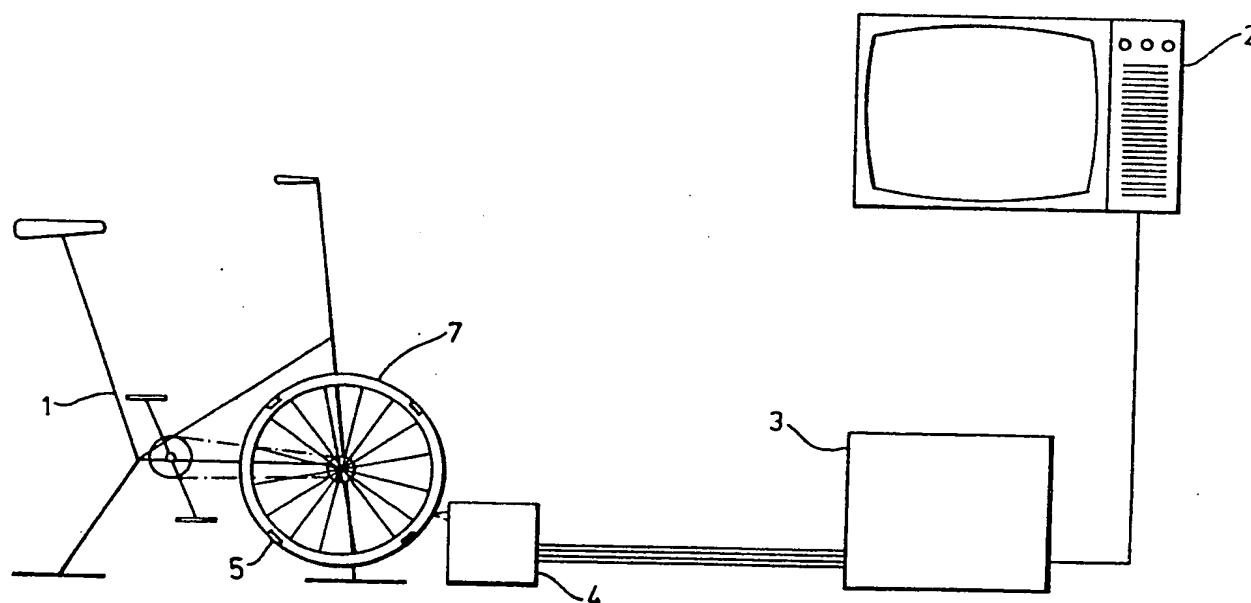
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(54) Exercise apparatus

(57) The apparatus includes an exercise device, e.g. cycle, rowing machine etc, having a moveable member, a piece of video and/or audio equipment and means, comprising a sensor unit and control means, for

connecting the device and the equipment together in such a way that operation of the device affects the signal from the equipment. In the embodiment shown the sensor unit includes a light sensor 10 which detects a notional distance travelled, a timer and a unit 13 for using these components to give a continuous output signal proportional to the notional speed of the device, which signal can be read by the control means and used to modify the visual and/or audio output display on the equipment as a function thereof.

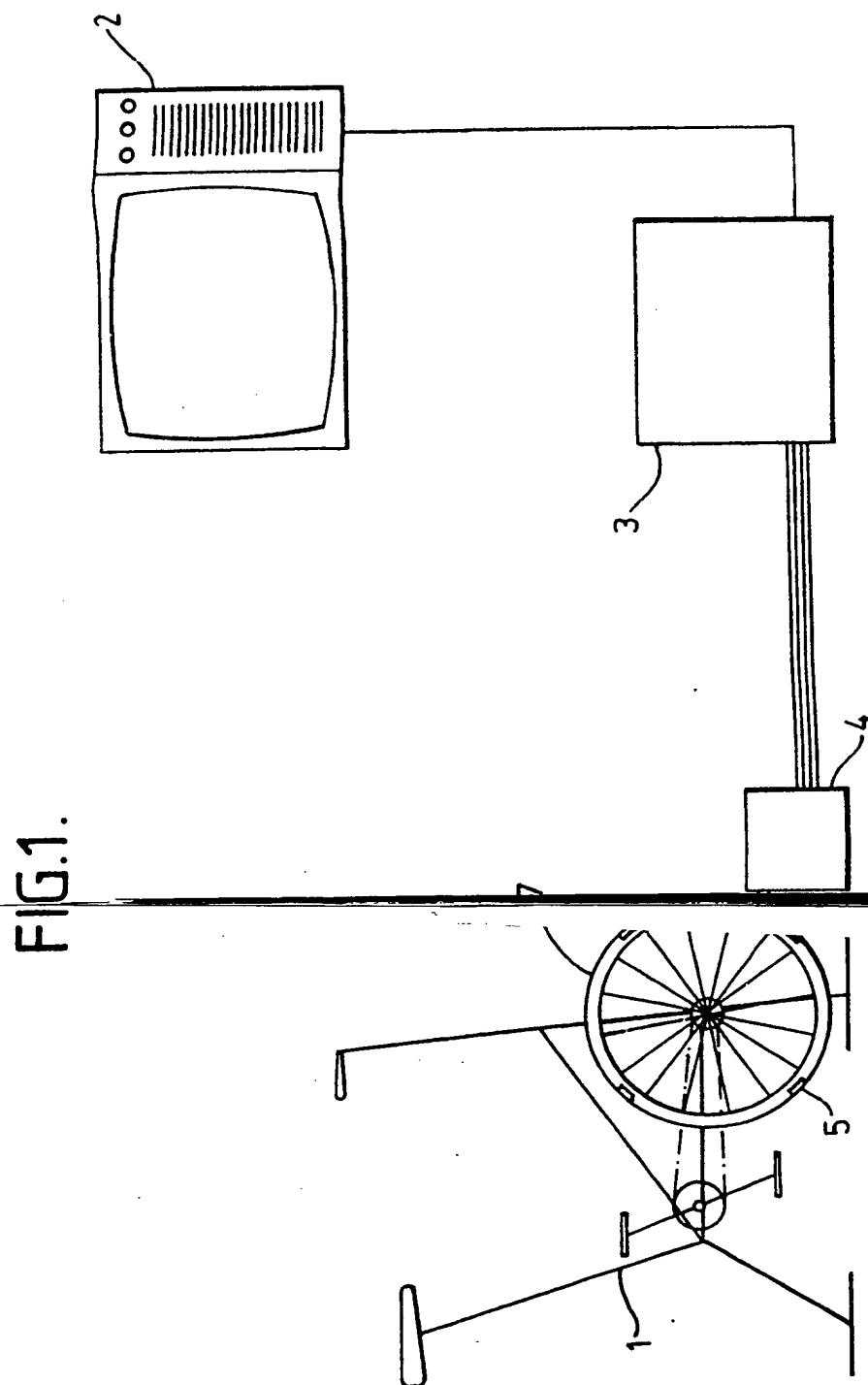
FIG.1.



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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

1/2



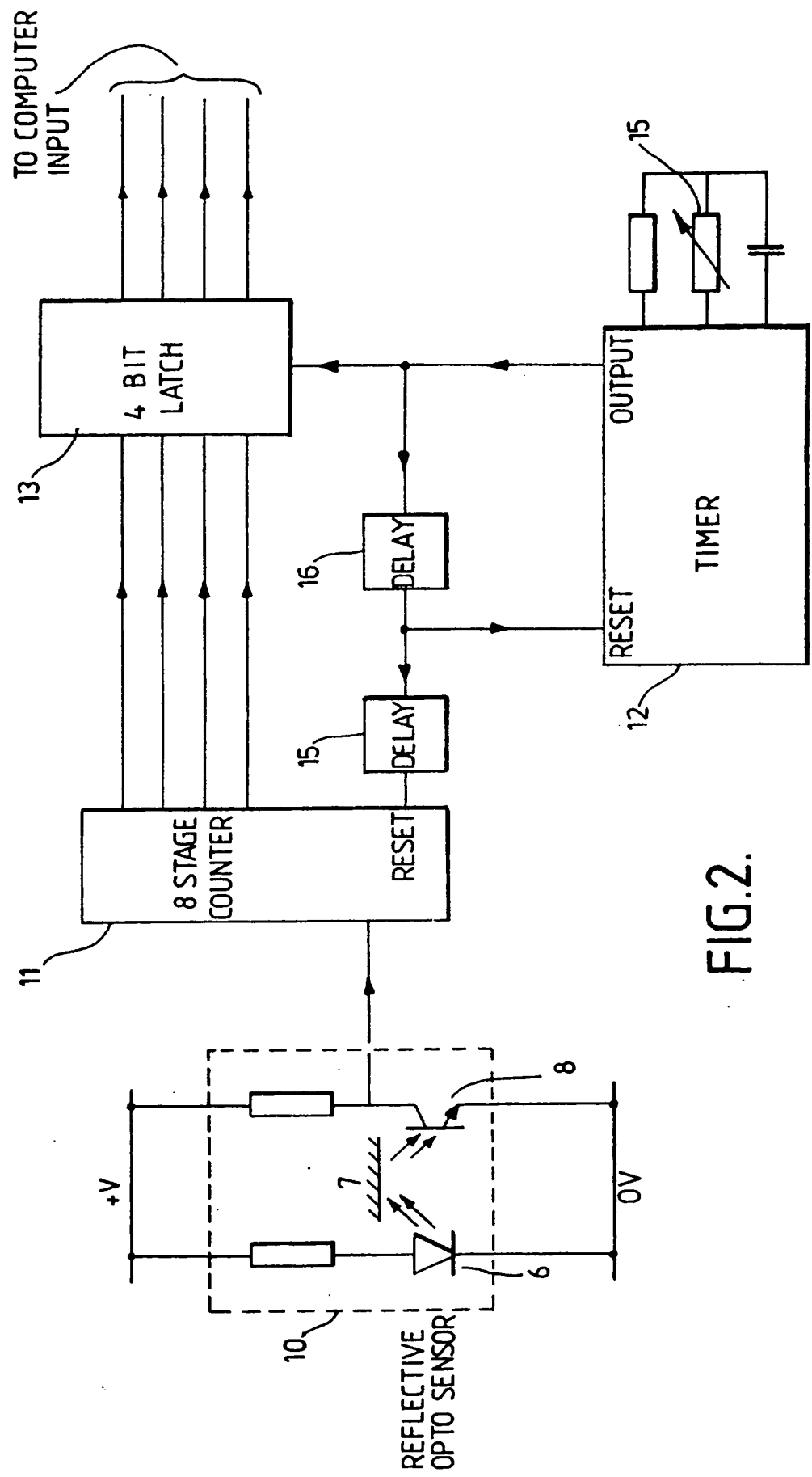


FIG.2.

## SPECIFICATION

## Improvements in exercise apparatus

The present invention relates to exercise apparatus, and in particular to improvements in such apparatus to reduce the boredom often experienced in using such apparatus.

Exercise apparatus at present in use is used mainly to exercise the body indoors when it is impossible or unpleasant to exercise outdoors. The problem with such apparatus is that exercise for any length of time is boring, which reduces the incentive to use the apparatus.

According to the present invention there is provided exercise apparatus comprising an exercise device and video and/or audio equipment, together with means for connecting the device and the equipment together in such a way that operation of the device effects the signal on the said equipment.

The exercise device may be a cycle, but the invention is equally applicable to other apparatus, for example rowing machines or running machines. The video equipment can have either its own screen or use an existing television screen and may include T.V. games apparatus or video recorder equipment. The connection between the device and the video or audio equipment may include mechanical, hydraulic or pneumatic elements as well as electrical elements.

Advantageously the said means for connecting the device includes sensor means for converting the effort expended on the exercise device into an electrical signal and control means electrically connected between the said sensor means and the said equipment to modify the visual and/or audible output on the said equipment as a function of the said signal.

The visual output would be in the form of a display on a screen which can be modified by adding to the display, subtracting from the display or re-arranging the display.

According to another aspect the invention provides an exercise system for encouraging the unenthusiastic to take exercise, the system comprising an exercise device, means for generating a signal representative of exercise being performed thereon, and an electronic game machine having a user input connected to receive the said signal, the game machine being programmed to generate a game in which a user can participate at least through the medium of the said signal.

The invention will now be described, by way of example, with reference to the accompanying drawings in which:—

Figure 1 illustrates one embodiment of the invention diagrammatically and in side view, and

Figure 2 is a circuit diagram of the sensor unit of Figure 1.

The apparatus illustrated comprises an exercise device in the form of a cycle 1 and video equipment in the form of a television 2. The display or picture formed on the television screen is arranged to be altered as a result of activity on

the cycle 1 by a signal from a sensor unit 4 mounted on the cycle frame. This signal is passed through a computer 3 and the picture which is displayed on the screen depends on how the computer program uses the elements of distance, time and derivatives thereof which are available.

Markers 5 are attached to the wheel so that they pass by the sensor unit 4. The colour of the marker must contrast with that of the background on which it is seen by the sensor so that the marker can be distinguished from the background.

The sensor unit 4 comprises a light emitting diode 6 which is continuously energised to illuminate the wheel of the cycle 7 with infra red light and a phototransistor 8 which is focussed on to the same illuminated position through an infra-red pass filter (not shown) which prohibits visible light reaching the phototransistor. The diode 6 and the phototransistor 8 together form a reflective optical sensor 10. The phototransistor is turned on when a marker is in front of the sensor 10 and is turned off when the background of the wheel 7 is viewed. The markers 5 can be applied in any suitable way. In the present embodiment white or silver foil tapes are attached to the black circumference of the wheel.

The sensor 10 is electrically connected to an eight stage binary counter 11, which is also part of the sensor unit 4. Each time a marker passes the optical sensor 10 the input to the counter changes from a high voltage to a low voltage and the counter 11 advances one count.

The counter 11 is reset regularly by a timer 12 so that it is continually counting up from zero at a rate proportional to the speed of the cycle wheel. Outputs from four selected stages in the counter 11 are taken to latches 13 which change to a new state corresponding exactly to the state of the counter 11 when the timer 12 sends a signal. A delay circuit 14 is interposed between the counter 11 and the timer 12 so that this signal reaches the latches before the counter is reset, and therefore the number represented by the state of the latches 13 is the maximum count in a predetermined time and is therefore proportional to the speed of the cycle wheel. A variable resistor 15 is connected to the timer 12 and by altering the resistance the timer interval can be adjusted so that the number forming the output from the latches 13 corresponds to conventional speed units (i.e. mph or km/h). A second delay circuit 16 between the timer output and its own reset input is there to make sure that the signal to the latches is present for an adequate length of time to load the state of the counter. The latches remain in the new state until a new number is loaded. Therefore the speed indication is always available at the output 17 of the sensor unit 4. This output can be read by a small computer 3 which can be programmed to use the speed of the cycle wheel to influence the picture on the screen of the television 2. The computer 3 is connected to the television 2 by means of the socket normally used for the aerial.

In the present embodiment the following can be produced on the television screen by the

computer:—

1. A digital display of the speed of the cycle wheel.

2. A black dot which moves around the screen on a circular locus at a rate proportional to the speed of the cycle wheel.

3. A black spiral which grows from the centre of the screen at a rate inversely proportional to the speed of the cycle wheel.

4. A digital display of a score which increases according to the effort spent on the cycle (i.e. product of speed and time).

When the spiral has expanded to the maximum which can be displayed on the screen, the computer terminates the game. The object of the game is to obtain a maximum score by this time. After a preset time the game recommences when the cycle wheel is rotated again.

It will be appreciated that the actual program used can be varied, and in a preferred embodiment of the invention the computer includes means for receiving a replaceable software package (not shown) for example in the form of a cassette or disc. Thus using different programs in the same equipment, distance, time and derivatives of these can be used in any programmable way to produce and influence the picture on the television screen.

It will be appreciated that the reflective optical sensor is only one of many electromagnetic radiation detectors that could be used. For example it would be possible to detect an electrostatic field, a magnetic field or visible light rays using appropriate markers, and convert to an electrical signal on passage of a marker.

In any embodiment where an electromagnetic radiation detector is used to provide an indication of the notional distance travelled, the apparatus may easily be adapted to suit different devices and the requirement of different users. To enable the detector to be used with a variety of different exercise devices, and so that users can adjust the gearing ratio between the device and the display, a number of self-adhesive markers, such as tapes, are used to trigger the detector. By adding to the number of tapes attached round the circumference of the wheel, for example, the displayed speed would be increased with respect to the actual rotational speed of the wheel. Therefore a range of displayed speeds could be selected without the need for external electronic controls, and a variety of different diameter wheels catered for.

Other example embodiments of the invention are as follows:

#### EXAMPLE A

An exercise cycle is connected to a video tape player in such a way that the turning of the pedals on the cycle activates the movement of the tape. Thus speeding up the pedal movement will speed up the picture movement on the screen. Thus when a video tape of a cycle trip is displayed, cycling on the exercise device makes scenery pass by on the screen. In this way a simulated journey could be produced. Advantageously the video

equipment may also be connected to effect the cycle, for example by increasing the resistance on the pedals where there is an uphill gradient on the screen. Audio equipment may be used in addition to the video equipment, for example to provide a guided tour. It will be appreciated that the cycle could be replaced by any suitable apparatus, for example a stationary running machine. The speed of the user can be taken off the exercise device in the same way as is described above.

#### EXAMPLE B

Video equipment displays a fixed display on the screen, such as a pint of beer, and operation of the exercise device alters the display, for example by reducing the amount of beer shown in the glass on the screen. The effect of the cycling on the display could be such that the quantity of beer is reduced according to the amount of exercise taken so that the beer eventually disappears when calories equivalent to a pint of beer have been worked off on the device. An energy count could also be displayed, either on the screen or separately, to show the total energy expended.

In each case the display may be formed on the screen either from the rear, as in a television screen, or from a projector spaced from a screen or wall.

The video equipment may include sound, be assisted by audio equipment or be replaced by audio equipment.

It will be appreciated that the exercise device could be connected to any video or audio equipment within the terms of the claims, where the result is an incentive to use the exercise device. Moreover more than one exercise device could be connected to the same equipment. For example if two devices were connected to the same piece of video equipment it would be possible to play a competitive game. Equally a program could provide a competitive game in which a single competitor might participate against the game machine.

Where the exercise device is a rowing machine or a cycle, the sensor unit can detect the passage of a member which is moved by the user of the device. Where the device is a running machine the machine moves the member from which the speed is detected, but the speed is still governed by the running speed of the user.

#### CLAIMS

1. Exercise apparatus comprising an exercise device and video and/or audio equipment, together with means for connecting the device and the equipment together in such a way that the operation of the device effects the signal on the said equipment.

2. Apparatus according to claim 1 wherein the said means for connecting the device includes sensor means for converting the effort expended on the exercise device into an electrical signal and control means electrically connected between the said sensor means and the said equipment to modify the visual and/or audio output on the said

equipment as a function of the said signal.

3. Apparatus according to claim 2 wherein the exercise device includes a member which moves during operation of the device at a speed proportional to the effort expended by the user, and the sensor means includes an electromagnetic radiation detector, the movable member carrying at least one marker which can be detected by the sensor means against the background of the said member.

4. Apparatus according to claim 3 wherein the marker contrasts in light reflectability with the colour of the said member, and the said sensor means includes an optical sensor which is arranged to transmit an electrical signal each time a marker passes the sensor.

5. Apparatus according to claim 4 wherein the optical sensor includes a light emitting diode and a phototransistor focussed on to the illuminated position of the member to receive reflected light from the member and to change its output signal when it detects the passage of a marker.

6. Apparatus according to any of claims 2 to 5 wherein the video equipment includes a television which is connected to the sensor unit through the control means, the arrangement being such that one or more signals relating to distance travelled, time elapsed, or derivations thereof are used to modify the display on the screen.

7. Apparatus according to any of claims 2 to 6 wherein the control means includes means for receiving a replaceable software package.

8. Apparatus according to any of claims 3 to 7 wherein the sensor means includes a counter which advances each time the sensor detects a marker.

9. Apparatus according to claim 8 wherein the sensor means includes a timer which is connected to the counter via a delay circuit, the timer acting to reset the counter after a predetermined time delay.

10. Apparatus according to claim 9 wherein the sensor means includes a latching mechanism connected to the output of the counter to provide a continuous signal proportional to the speed of the movable member.

11. Apparatus according to claim 9 or 10 wherein the timer includes a variable resistor by means of which the counter reset time can be adjusted.

12. Apparatus according to claim 3 or any claim appendant to claim 3 wherein the marker or markers are removably attached to the movable member.

13. An exercise system for encouraging the unenthusiastic to take exercise, the system comprising an exercise device, means for generating a signal representative of exercise being performed thereon, and an electronic game machine having a user input connected to receive the said signal, the game machine being programmed to generate a game in which a user can participate at least through the medium of the said signal.

14. An exercise apparatus or system

substantially as herein described, with reference to any of the accompanying drawings and examples.

New claims or amendments to claims filed on 5 May 1983.

Superseded claims 1—14.

New or amended claims:—

1. Exercise apparatus comprising an exercise machine on which a user can expend effort, sensor means for creating at least one electrical signal representative of the effort expended on the machine, video and/or audio equipment for producing an output which can be effected by the electrical signal or signals and control means electrically connected between the sensor means and the said equipment and adapted to monitor the electrical signal or signals and modify the said output as a function thereof.

2. Apparatus according to claim 1 wherein the exercise machine includes a part which is movable at a speed related to the effort expended on the machine and the sensor means is adapted to sense the speed of movement of the said part and generate at least one electrical signal which is a function of the said speed.

3. Apparatus according to claim 1 or 2 wherein the control means has an output electrically connected to the equipment which output is in the form of a picture creating signal adapted to represent the user on the equipment as a symbol, the speed of movement of which is governed by the said control means as a function of the said electrical signal.

4. Apparatus according to any of the preceding claims wherein the control means includes means for accepting a replaceable software package.

5. Apparatus according to any of the preceding claims wherein the control means is a computer programmed to monitor repeatedly the electrical signal from the sensor means and to execute a sequence of instructions determined by the status of the electrical signal monitored.

6. Apparatus according to any of the preceding claims wherein the control means is adapted to generate a game in which the user can participate through the medium of the signal.

7. Apparatus according to claim 6 wherein the equipment includes a visual display on which the progress of the game can be viewed.

8. Apparatus according to claim 7 or 8 wherein the control means is in the form of a unit having input terminals to which the sensor means is electrically connected.

9. Apparatus according to claim 8 wherein the control means has a plurality of said input terminals which can be connected to receive signals from two or more users on respective exercise machines.

10. Apparatus according to any of claims 6 to 9 wherein the control means is adapted to modify its output in response to the signal or signals in such a way that more strenuous use of the exercise machine helps the user to achieve a better

performance in the game.

11. Apparatus according to any of the preceding claims wherein the sensor means includes at least one electromagnetic radiation  
5 detector which detects the passage of one or more markers in relation thereto, one of the sensor means and the marker or markers being adapted to be fitted on a part of the machine that is

- movable as a result of the exercise being taken,  
10 the sensor means being adapted to emit one or more signals representative of the effort of the user as a function of the speed of movement of the movable part.

12. Exercise apparatus substantially as herein  
15 described with reference to the accompanying drawings and examples.

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